

Having thus, described the invention, what is claimed is:

1. A hydraulic continuously variable transmission comprising:

a transmission casing;

an axial plunger pump comprising:

a pump cylinder rotatably supported in said casing and provided with a plurality of pump plunger holes arranged in an annular layout surrounding the rotational axis thereof and penetrating therethrough in the axial direction, and

a plurality of pump plungers slidably fitted in said pump plunger holes;

an axial plunger motor, comprising:

a motor cylinder rotatably supporting on said casing and provided with a plurality of motor plunger holes arranged in an annular layout surrounding the rotational axis thereof and penetrating therethrough in the axial direction, and

a plurality of motor plungers slidably fitted in said motor plunger holes; and

a closed hydraulic circuit connecting a pump discharge port and a pump suction port of said axial plunger pump, respectively, to a motor suction port and a motor discharge port of said axial plunger motor;

wherein pump discharge openings are provided at end portions of said pump plunger holes opposite end faces of said pump plungers, for discharging a hydraulic fluid pushed out attendant on sliding movements of said pump plungers in said pump plunger holes, and

said pump discharge openings are smaller than said pump plunger holes and are offset from the center axes of said pump plunger holes toward the rotational axis of said pump cylinder.

2. The hydraulic continuously variable transmission as set forth in claim 1, wherein said pump discharge openings are each formed in a circular shape.

3. The hydraulic continuously variable transmission as set forth in claim 1, wherein said pump discharge openings are each formed in an elliptic shape with a minor axis in a radial direction of said pump cylinder.

4. The hydraulic continuously variable transmission as set forth in claim 1, wherein motor discharge openings for discharging a hydraulic fluid pushed out attendant on sliding movements of said motor plungers in said motor plunger holes are provided at end portions of said motor plunger holes opposite end faces of said motor plungers; and said motor discharge openings are smaller than said motor plunger holes and are offset from the center axes of said motor plunger holes toward the rotational axis of said motor cylinder.

5. A hydraulic continuously variable transmission, comprising:

a hollow transmission housing;

a motor casing disposed within said transmission housing;

a motor pivot member supported by said motor casing;

a swash plate plunger pump disposed within said housing and comprising a pump swash plate and a pump cylinder having a plurality of pump plunger holes formed therein to slidably receive a plurality of pump plungers;

a swash plate plunger motor rotatably supported on said motor pivot member and comprising a motor swash plate and a motor cylinder having a plurality of motor plunger holes

formed therein to slidably receive a plurality of motor plungers; and

an output shaft extending through and supporting said pump cylinder and said motor cylinder, said output shaft being rotatably supported in said housing through a plurality of rotatable bearings;

wherein pump discharge openings are provided at end portions of said pump plunger holes opposite end faces of said pump plungers, for discharging a hydraulic fluid pushed out attendant on sliding movements of said pump plungers in said pump plunger holes, and

said pump discharge openings are smaller than said pump plunger holes and are offset from the center axes of said pump plunger holes toward the rotational axis of said pump cylinder.

6. The hydraulic continuously variable transmission as set forth in claim 5, wherein said pump discharge openings are each formed in a circular shape.

7. The hydraulic continuously variable transmission as set forth in claim 5, wherein said pump discharge openings are each formed in an elliptic shape with a minor axis in a radial direction of said pump cylinder.

8. The hydraulic continuously variable transmission as set forth in claim 5, wherein motor discharge openings for discharging a hydraulic fluid pushed out attendant on sliding movements of said motor plungers in said motor plunger holes are provided at end portions of said motor plunger holes opposite end faces of said motor plungers; and said motor discharge openings are smaller than said motor plunger holes and are offset from the center axes of said motor plunger holes toward the rotational axis of said motor cylinder.